WHAT IS CLAIMED IS:

1. A method for correcting spacecraft thermal distortion antenna pointing errors, comprising:

measuring spacecraft thermal distortion parameter values using one or more spacecraft sensors, the spacecraft thermal distortion parameter values being related to spacecraft thermal distortions;

calculating estimated antenna thermal distortion pointing errors caused by the spacecraft thermal distortions using the measured spacecraft parameter values; and

adjusting the antenna pointing to correct for the estimated antenna pointing errors.

2. The method as recited in claim 1, wherein the one or more spacecraft sensors comprise one or more strain gages, and the measured spacecraft parameter values comprise spacecraft strain values.

3. The method as recited in claim 1, wherein the one or more spacecraft sensors comprise one or more temperatures sensors, and the measured spacecraft parameter values comprise spacecraft temperature values.

4. The method as recited in claim 1, wherein adjusting the antenna pointing comprises adjusting an antenna gimbal arm to which the antenna is attached.

5. The method as recited in claim 1, wherein adjusting the antenna pointing comprises adjusting the attitude of the spacecraft.

6. The method as recited in claim 1, wherein the method is performed repetitively at a sampling interval.

7. The method as recited in claim 1, further comprising:

computing expected spacecraft thermal distortion parameter values;

computing expected antenna thermal distortion pointing errors; and

using the expected spacecraft thermal distortion parameter values, the measured spacecraft thermal distortion parameter values, and the expected antenna thermal distortion pointing errors to calculate the estimated antenna thermal distortion pointing errors.

8. The method as recited in claim 7, wherein the expected spacecraft thermal distortion parameter values are generated using one or more input parameters selected from the group consisting of sun vector information, solar flux information, and spacecraft panel dissipation information.

9. The method as recited in claim 7, wherein the expected antenna thermal distortion pointing errors are generated using one or more input parameters selected from the group consisting of sun vector information, solar flux information, and spacecraft panel dissipation information.

10. A method for correcting spacecraft thermal distortion antenna pointing errors, comprising:

computing expected spacecraft thermal distortion parameter values;

computing expected antenna thermal distortion pointing errors;

measuring spacecraft thermal distortion parameter values using one or more spacecraft sensors, the spacecraft thermal distortion parameter values being related to spacecraft thermal distortions;

calculating antenna thermal distortion pointing error correction values using the expected spacecraft thermal distortion parameter values and the measured spacecraft thermal distortion parameter values;

using the expected antenna thermal distortion pointing errors and the antenna thermal distortion pointing error correction values to generate final antenna thermal distortion pointing error estimates; and

adjusting the antenna pointing to correct for the final antenna pointing error estimates.

11. The method as recited in claim 10, wherein the one or more spacecraft sensors comprise one or more strain gages, and the measured spacecraft thermal distortion values comprise spacecraft strain values.

12. The method as recited in claim 10, wherein the one or more spacecraft sensors comprise one or more temperatures sensors, and the measured spacecraft thermal distortion values comprise spacecraft temperature values.

13. The method as recited in claim 10, wherein adjusting the antenna pointing comprises adjusting an antenna gimbal arm to which the antenna is attached.

14. The method as recited in claim 10, wherein adjusting the antenna pointing comprises adjusting the attitude of the spacecraft.

15. The method as recited in claim 10, wherein the method is performed repetitively at a sampling interval.

16. The method as recited in claim 10, wherein the expected antenna thermal distortion pointing errors are generated using one or more input parameters selected from the group consisting of sun vector information, solar flux information, and spacecraft panel dissipation information.

17. The method as recited in claim 10, wherein the expected spacecraft thermal distortion parameter values are generated using one or more input parameters selected from the group consisting of sun vector information, solar flux information, and spacecraft panel dissipation information.

18. The method as recited in claim 10, wherein the final antenna pointing error estimates are a function of the expected antenna thermal distortion pointing errors and the antenna thermal distortion pointing error correction values according to the equation:

$$\hat{\phi} = \overline{\phi} + K_{\phi}\,\Delta\phi,\ \ \hat{\theta} = \overline{\theta} + K_{\theta}\,\Delta\theta \quad .$$

19. A system for correcting spacecraft thermal distortion antenna pointing errors, comprising:

one or more spacecraft sensors located at positions on a spacecraft and adapted to measure spacecraft parameters at the positions;

a spacecraft distortion prediction module adapted to generate expected spacecraft thermal distortion parameter values and to generate expected antenna thermal distortion pointing errors;

a spacecraft parameter processing module adapted to generate measured spacecraft thermal distortion parameter values from the measured spacecraft parameters;

an antenna pointing error calculation module adapted to calculate antenna pointing error correction commands using the using the expected spacecraft thermal

distortion parameter values, the measured spacecraft thermal distortion parameter values and the expected antenna thermal distortion pointing errors;

an antenna pointing control module adapted to receive the antenna pointing correction commands and control the adjustment of the antenna pointing using the correction commands.

20. The system as recited in claim 19, wherein the spacecraft distortion prediction module, the spacecraft parameter processing module, the antenna pointing error calculation module, and the antenna pointing control module are configured as one or more processing modules.

21. The system as recited in claim 19, wherein the one or more sensors are selected from the group consisting of strain gage sensors, temperature sensors, or a combination of strain gage sensors and temperature sensors.

22. The system as recited in claim 19, wherein the antenna pointing error calculation module calculates the antenna pointing error correction commands by:

calculating antenna thermal distortion pointing error correction values using the expected spacecraft thermal distortion parameter values and the measured spacecraft thermal distortion parameter values;

calculating final antenna thermal distortion pointing error estimates using the expected antenna thermal distortion pointing errors and the antenna thermal distortion pointing error correction values; and

generating the antenna pointing error correction commands using the final antenna thermal distortion pointing error estimates.

23. The system as recited in claim 19, wherein the spacecraft distortion prediction module uses one or more input parameters selected from the group consisting of sun vector information, solar flux information, and spacecraft panel dissipation information to generate the expected spacecraft thermal distortion parameter values and to generate the expected antenna thermal distortion pointing errors.

24. The system as recited in claim 19, wherein the antenna is attached to a gimbal arm, and wherein the antenna pointing control module controls the antenna pointing by controlling the gimbal arm.

25. The system as recited in claim 19, wherein the antenna is attached to the spacecraft body, and wherein the system further comprises an spacecraft attitude control system which changes the attitude of the spacecraft in order to change the antenna pointing.

26. The system as recited in claim 19, wherein the antenna pointing error calculation module calculates the final antenna thermal distortion pointing error estimates as a function of the expected antenna thermal distortion pointing errors and the antenna thermal distortion pointing error correction values according to the formula:

$$\hat{\phi} = \overline{\phi} + K_{\phi}\,\Delta\phi,\ \ \hat{\theta} = \overline{\theta} + K_{\theta}\,\Delta\theta\,.$$